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HANDLE FOR DOORS OR HINGED LIDS OF VEHICLES

The invention concerns a handle with a built-in push-button switch. If the handle and/or the push-button switch is manually operated, a locking system in the vehicle is acted upon, which serves to lock, unlock, open, and/or close a lock in the door or hinged lid. Besides the push-button switch, the handle accommodates other electric or electronic components, such as a capacitance sensor, which already responds when a hand approaches the handle and acts on the locking system.

In the previously known handle of this type (DE 196 17 038 C2), the push-button switch and the electronic components were sealed inside the handle after they had been installed. If defects developed in the bush-button switch, it was necessary to dismount the entire handle and replace it with a new handle. This was expensive and time-consuming.

Electromechanical push-button switches with a housing, an elastic membrane, and a nondeformable push button are well known (DE 34 47 085 A1, DE 42 08 087 C1). However, these were

assembled from individual plastic components and were not integrated in the handles of vehicles.

An electrical snap-action switch assembled from numerous mechanical components (DE 44 21 275 A1) had a housing, which was sealed in the area of the opening after the mechanical and electrical components had been installed. A circuit board with a microswitch was not used here. There was no push button integrated in a membrane.

In the case of an actuator that is not integrated in a handle that can be independently manually actuated (DE 100 20 172 A1), it is known that a membrane can first be snapped into an opening of a frame seated on the vehicle hatch. A shell-like housing is then provided with a microswitch and an actuating lever and placed with the shell-like opening on the inner surface of the membrane. A staple is used to hold the housing shell and the membrane together. The microswitch and the actuating lever are enclosed on all sides by the housing shell and the membrane. The microswitch is actuated by pressing the membrane via the lever. Due to the assembly of this actuator on the vehicle, the production costs are high.

In a handle with an integrated push-button switch (DE 198 56 902 C2), it is known that the push-button switch can be

formed from a shell-like assembly in a multiple-component injection-molding technique. The shell-like assembly consists of a soft component and a hard component, which form a combined multiple-component insert. The wall of the shell consists of the soft component, the end of which has radial snap-in elements that snap into corresponding recesses in the inside of the handle. Before the insertion of the shell-like housing, the microswitch and its leads must first be installed inside the handle. A reliable seal of the installed microswitch against splashed water is not guaranteed. The assembly of the push-button switch from its components in the handle is expensive.

The objective of the invention is to develop a reliable, inexpensive handle of the aforementioned type, which can be produced quickly and easily. In accordance with the invention, this objective is achieved by the measures specified in Claim 1, which have the following special significance.

Essentially two assemblies are used to produce the push-button switch. There is a first assembly, which is produced as a single piece in a three-plastic-component injection-molding technique and will be referred to hereinafter simply as the "shell unit". This shell unit consists of a nondeformable shell-like housing, an elastic membrane that seals the base of

the visible end of the shell, and a nondeformable push button on the membrane at the base. The shell unit has a shell-like opening on its rear side opposite the membrane. The second assembly is preassembled from the following individual parts: a circuit board with electrical feed and conduction cables and a microswitch mounted on the circuit board. This second assembly is inserted into the interior of the shell unit and thus constitutes an "insertion unit".

The position of the insertion unit in the shell-like housing of the shell unit is secured by a safety plate. The safety plate at least partially covers the circuit board of the inserted shell unit. This facilitates the last production step, in which the remaining part of the shell edge of the housing of the shell unit serves as a mold. A sealing compound is applied to this remaining shell edge. Once the sealing compound has hardened, it seals the shell opening and thus makes the housing media-tight.

It is thus possible to check the push-button switch before it is installed in the cavity of the handle. If a push-button switch fails after extended use, it can be easily replaced in the handle of the invention without having to replace the entire handle at great expense. The sealing compound used in the

handle of the invention is used in small amounts and allows the push-button switch and thus the handle to be quickly produced. Finally, the handle of the invention is readily disassembled and its component parts can be easily recycled.

Further measures and advantages of the invention are apparent from the dependent claims, the following description, and the drawings. A specific embodiment of the invention is illustrated in the drawings.

-- Figure 1 shows the handle of the invention in the unmounted state before being installed in a door.

-- Figure 2 shows an enlarged side view of the electrical and electronic components that are installed inside the handle shown in Figure 1.

-- Figure 3 shows a further enlarged, front perspective view of the push-button switch integrated in the handle.

-- Figure 4 shows a cross section through the push-button switch shown in Figure 3 along the crank-shaped sectional line IV-IV in Figure 9.

-- Figure 5 shows a greatly enlarged perspective view of the rear side of a first injection-molded assembly for the push-button switch after a spring-tensioned pusher has been installed.

-- Figure 6 shows a perspective view of the rear side of the first assembly, corresponding to the view in Figure 5, after a volume reducer has been inserted inside the shell of the housing.

-- Figure 7 shows a perspective rear view of the first assembly, corresponding to Figures 5 and 6, after a second assembly, which consists of a circuit board and a microswitch with attached cables, has been installed there.

-- Figure 8 shows, in the same view as Figure 7, the following production step, where a safety plate covers the rear side of the circuit board.

-- Figure 9 shows, in the same view as in Figures 5 to 8, the rear side of the finished push-button switch after the projecting end of the shell has been filled in with a sealing compound.

One end 11 of the handle 10 of the invention has a bearing receptacle 13, about which the handle 10 can be manually turned when it is mounted in a door or hinged lid. At the other end 12 of the handle 10, there is a shaft 14, which engages the inside of the door and has a terminal hooked head 15, which acts on a lock located inside the door during the aforesaid turning movement of the handle 10. This operation is normally carried

out to open the door when the lock is unlocked. The lock is part of a complex locking system.

This locking system also includes a proximity sensor, which is integrated in the interior of the hollow handle 10. The proximity sensor 16 is shown in the unmounted state in Figure 2 and is activated, normally by capacitance, when the hand approaches the handle 10. The generation and conduction of the sensor signals occurs via electrical cables 17, which, as shown in Figure 1, emerge at the supported end 11 of the handle and end in an electrical coupling, such as a plug 18. Additional electronic components can be installed on the support 16 of the proximity sensor, and, in particular, cables 19 can lead off from it to a special push-button switch 20. The push-button switch 20 has the following construction, which is shown in Figures 3 to 9.

As is shown best in Figure 4, the first assembly 21 consists of a single-piece injection-molded part, which comprises three plastic components. There is a first, nondeformable plastic component, which forms the outer shell-like housing 22. One end of the shell-like housing 22 is sealed at the base with a profiled membrane 23, which is made of an elastic plastic and constitutes the second component, in which a

push button 24 made of another nondeformable plastic is centrally integrated as the third component. The push button 24 consists of a plate, whose outer surface 25 is used for actuation. In the installed state, as shown in Figure 1, this outer surface 25 is flush with the curved outer surface of the handle, and the lateral parts of the membrane 23 seal the opening in the handle provided for the push button. Due to the fact that this first assembly 21 is shaped like a shell, it is referred to here as the "shell unit", as has already been mentioned.

This shell unit 21 also includes the following additional elements, which are shown in Figures 4 and 5 and are also produced as a single piece with the unit 21 during the injection-molding process. These elements include, first, an axial extension 26, which is formed on the inside surface of the push button 24 and has a central receptacle 27 for a mushroom-shaped pusher 40. The pusher 40 has an expanded foot 41, which is connected with the axial extension 26 by snapping into place through a narrowed opening of the receptacle 27. The pusher 40 is held in a spring-tensioned pushed-out position in the receptacle 27 by a spring 42 arranged between its mushroom-shaped head 40 and the push button 24. Figure 5 shows the

installed position of the pusher 40 with its spring 42 in a view through the still open shell opening 28. A shell edge 43 projects a considerable axial distance beyond the base 29 of the shell on the rear side.

The shell unit 21 is provided with other single-piece members. The shell-like housing 22 is provided with an inner shoulder 29. Pins 44 are formed on the inner shoulder 29. The pins 44 run axially and are directed towards the shell opening 28 of the shell unit 21. In addition, two segmental projections 45 are formed on the inner surface of the push button 24. These projections pass through the membrane layer 23, extend axially into the interior 46 of the shell, and are positioned a certain radial distance from the aforementioned pusher 40.

As Figure 6 shows, a ring-shaped plastic volume reducer 35, which is shaded in Figure 6 for emphasis, is then inserted into the interior 46 of the shell of the shell unit 21. The inside of the ring-shaped reducer 35 encloses the other central components, such as the aforementioned axial projections 45 of the shell unit 21, at a radial distance 36, which is shown in Figure 4. The reducer 35 reduces the air volume in the interior 46 of the shell and is held by means of mutually complementary peripheral profiles of the elastic membrane 23 of the shell unit

21.

The push-button switch of the invention also includes a second assembly 31, which is preassembled from its individual components. This preassembled assembly 31 is inserted into the interior 46 of the shell and therefore will be referred to hereinafter simply as the "insertion unit" to distinguish it from the shell unit 21. As is shown best in Figure 4, this insertion unit comprises, first, a circuit board 33 with conducting tracks, to which the aforementioned electrical cables 19 are already connected on one of the surfaces. On the other surface of the circuit board 33, a microswitch 30 is mounted, which is in contact with the conducting tracks and has an axially movable contact actuator 32. The pins 44 are used for the insertion of the insertion unit 31 into the interior 46 of the shell. The circuit board 33 has holes 34, which are shown best in Figures 4 and 7, and through which the pins 44 of the shell unit 21 extend after the insertion of the insertion unit 31. As Figure 7 shows, after the insertion unit 31 has been inserted, the housing 22 still has a projecting shell edge 43, which is used to mount additional elements, as shown in Figures 8 and 9.

As Figure 8 shows, a safety plate 37 is first placed on the

rear side of the inserted circuit board 33. The purpose of this safety plate 37 is to secure the position of the assembled insertion unit 31 in the shell unit 21. To this end, sharp-pointed tips 38 are provided along the periphery of the safety plate 37. When the safety plate 37 is placed on the rear side of the circuit board 33, the sharp-pointed tips 38 penetrate the projecting shell edge 43 and become fixed in the inner wall surface. This secures the assembled position of the two assemblies 21, 31. The safety plate 37 also has holes 39 that are aligned with the pins 44, which pass through the holes 39 when the safety plate 37 is mounted. This secures the radial position of the safety plate 37 behind the assembled assemblies 21, 31.

As Figure 8 shows, a portion 47 of the shell edge 43 is left exposed behind the safety plate 37. This remaining part 47 of the shell edge 43 is used in the last production step as a mold for receiving a sealing compound 48, which is shaded in Figure 9 for emphasis. The sealing compound 48 seals the shell opening 28 media-tight.

Instead of the separate safety plate 37, the secured position between the two assemblies 21, 31 can also be achieved by pins and holes (not shown), which are provided between the

two assemblies 21, 22 and engage each other when the two assemblies are fitted together. The assemblies are then held together by deformation at the ends of the pins that extend from the holes. This deformation of the ends of the pins can be accomplished by bending or welding the ends of the pins.

List of Reference Numbers

10 handle (Figure 1)

11 first, supported end of the handle 10 (Figure 1)

12 other, actuating end of the handle 10 (Figure 1)

13 bearing receptacle at 11 (Figure 1)

14 shaft at 13 (Figure 1)

15 hooked head on 14

16 proximity sensor support (Figure 2)

17 electrical cable (Figure 2)

18 electrical coupling on 17, plug (Figure 1)

19 electrical cable between 16 and 20 (Figure 2)

20 push-button switch

21 first assembly, shell unit (Figure 4)

22 nondeformable shell-like housing of 21 (Figure 4)

23 elastic membrane of 21 (Figure 4)

24 nondeformable push button of 21 (Figure 4)

25 outer surface of 24 (Figure 4)

26 inner axial extension on 24 (Figure 4)

27 receptacle in 26 for 40 (Figure 4)

28 shell opening of 22 (Figure 5)

29 inner shoulder of 22 (Figure 4, 5)

30 microswitch of 31 (Figure 4)

31 second assembly of 20, insertion unit (Figure 4)

32 contact actuator of 30 (Figure 4)

33 circuit board of 31 (Figure 4)

34 hole in 33 (Figure 4)

35 volume reducer (Figures 4, 5)

36 radial distance between 45, 35 (Figure 4)

37 safety plate (Figures 4, 8)

38 sharp-pointed tips on 37 (Figure 8)

39 hole in 37 (Figure 8)

40 pusher with mushroom-shaped head (Figure 4)

41 foot of 40 (Figure 4)

42 compression spring of 40 (Figure 4)

43 shell edge of 22 (Figure 4, 5)

44 pins on 29 of 22 (Figure 4)

45 projections on 24 (Figures 4, 5)

46 interior of shell (Figure 4)

47 remaining part of shell edge 43 (Figure 8)

48 sealing compound (Figure 9)